Mr. Michael T. Davis Calculus	Section 2.4 Deriving Slope Functions October 31, 2016

Name: Solutions

1. Use the limit as h approaches zero and the slope of a secant line to derive the slope function for the given function $f(x)=2x^2+5$ at the point $x=a$. Show all the steps in the process very neatly and carefully. Do not rush through this.

$$\lim_{h\to 0}\frac{f(a+h)-f(a)}{a+h-a}=\lim_{h\to 0}\frac{2(a+h)^2+5-(2a^2+5)}{h}=$$

$$=\lim_{h\to 0}\frac{2(a^2+2ah+h^2)+5-2a^2-5}{h}=$$

$$=\lim_{h\to 0}\frac{2a^2+4ah+2h^2+5-2a^2-5}{h}=\lim_{h\to 0}\frac{4ah+2h^2}{h}=$$

$$=\lim_{h\to 0}(4a+2h)=4a$$

the slope function is $m=4a$

2. Use the limit as h approaches zero and the slope of a secant line to derive the slope function for the given function $f(x)=3x^2-7x$ at the point $x=a$. Show all the steps in the process very neatly and carefully. Do not rush through this.

$$\lim_{h\to 0}\frac{f(a+h)-f(a)}{a+h-a}=\lim_{h\to 0}\frac{3(a+h)^2-7(a+h)-(3a^2-7a)}{h}=$$

$$=\lim_{h\to 0}\frac{3(a^2+2ah+h^2)-7a-7h-3a^2+7a}{h}=$$

$$=\lim_{h\to 0}\frac{3a^2+6ah+3h^2-7a-7h-3a^2+7a}{h}=$$

$$=\lim_{h\to 0}\frac{6ah+3h^2-7h}{h}=\lim_{h\to 0}(6a+3h-7)=6a-7$$

the slope function is $m=6a-7$

3. Use the limit as h approaches zero and the slope of a secant line to derive the slope function for the given function $f(x)=x^3-4x^2$ at the point $x=a$. Show all the steps in the process very neatly and carefully. Do not rush through this.

$$\lim_{h\to 0}\frac{f(a+h)-f(a)}{a+h-a}=\lim_{h\to 0}\frac{(a+h)^3-4(a+h)^2-(a^3-4a^2)}{h}=$$

$$=\lim_{h\to 0}\frac{a^3+3a^2h+3ah^2+h^3-4(a^2+2ah+h^2)-a^3+4a^2}{h}=$$

$$=\lim_{h\to 0}\frac{a^3+3a^2h+3ah^2+h^3-4a^2-8ah-4h^2-a^3+4a^2}{h}$$

$$=\lim_{h\to 0}\frac{3a^2h+3ah^2+h^3-8ah-4h^2}{h}$$

$$=\lim_{h\to 0}(3a^2+3ah+h^2-8a-4h)$$

$$=3a^2-8a$$

The slope function is $m=3a^2-8a$